## AT A GLANCE

## **Technology forecasting**



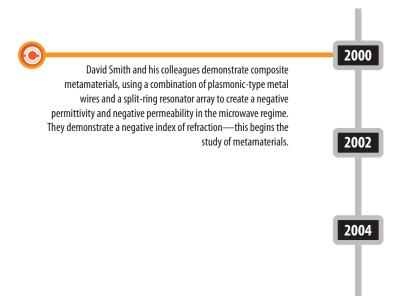
The limitations of natural materials are a major obstacle that must be overcome to meet the ever-increasing demand for faster, lighter, cheaper, and more compact devices. By providing effective material properties not found in nature, electromagnetic metamaterials have the potential to aid in the creation of ultrathin planar lenses, superresolution microscopes, compact antennas, faster computer chips, and surfaces that radically alter or cloak the electromagnetic signature of an object.

Transistors are the building blocks to computer chips; as they get smaller, computers get faster and more energy efficient. But transistors and the copper wires that connect to them can only shrink so much before they reach the limits of quantum mechanics. Researchers are making strides in other fields to solve this problem and find new methods.

Homomorphic encryption allows operations to be performed on encrypted data without sharing the secret key needed to decrypt the data. If a practical, fully homomorphic solution can be created, it could be the catalyst that breaks down the security barrier to widespread cloud adoption.

The energy dissipation of complementary metal-oxide semiconductor transistors is reaching physical limits and has become a difficult barrier to building more powerful supercomputers. Digital integrated circuits based on superconductive single-flux-quantum (SFQ) logic offers a combination of high-speed and ultralow power dissipation unmatched by any other device.

Plasmonic interconnects are composed of optical fields bound to metal surfaces; they offer the benefits of high-bandwidth signaling with physical confinement down to the true nanoscale due to the metals on which plasmons are supported. Plasmonic interconnects have the potential to alleviate the current communications bottleneck in computer architectures.







The Next Wave is published to disseminate technical advancements and research activities in telecommunications and information technologies. Mentions of company names or commercial products do not imply endorsement by the US Government.

 $This \ publication \ is \ available \ on line \ at \ http://www.nsa.gov/research/tnw/index.shtml. \ For \ more \ information, \ please \ contact \ us \ at \ at \ publication \ is \ available \ on line \ at \ http://www.nsa.gov/research/tnw/index.shtml.$ TNW@tycho.ncsc.mil.





